

5.0 Bridges

5.0 Bridges

The State of Maine has full or partial responsibility for 2,967 bridge and minor span structures with lengths ranging from 10 feet to 4,750 feet. The following report details the assets, condition and funding needs of this network.

5.1 Bridge Network

The State of Maine has full responsibility for capital improvement and maintenance of 775 minor spans (10 feet to 20 feet long) and 1,962 bridges generally equal to or greater than 20 feet in length, and 21 extraordinary bridges. Extraordinary bridges are 250 feet or more in length and require improvements of at least \$5 million each in the next 20 years.

Wiscasset-Edgecomb, Donald Davies Bridge



In addition, the state will pay half of the capital improvement costs for 209 low-use/redundant (town maintained) bridges on town ways if a compelling public benefit is demonstrated. Low use/redundant bridges are those bridges on town ways that either serve fewer than 100 vehicles per day or are close to other crossings (average annual daily traffic multiplied by the detour length is less than 200). Some low use/redundant bridges have serious deficiencies from an engineering standpoint, but are given low priorities due to their minimal benefit to the traveling public.

This report examines the state's bridge and minor span network in terms of the following indicators: age, percent sufficient (the percentage of structures with a federal sufficiency rating greater than 60), federal sufficiency rating weighted by deck area; extraordinary bridge needs; and priority functional needs. In aggregate, these indicators provide valuable planning insight for the state's current bridge and minor span inventory. Excluded from this report are: new crossing sites where there has been no bridge construction to date; structures used exclusively for rail, pedestrian or snowmobile traffic; structures owned by the Maine Turnpike Authority, federal agencies, or private entities; and minor spans on town ways owned and maintained by municipalities.

5.1.1 Age of Maine's Structures

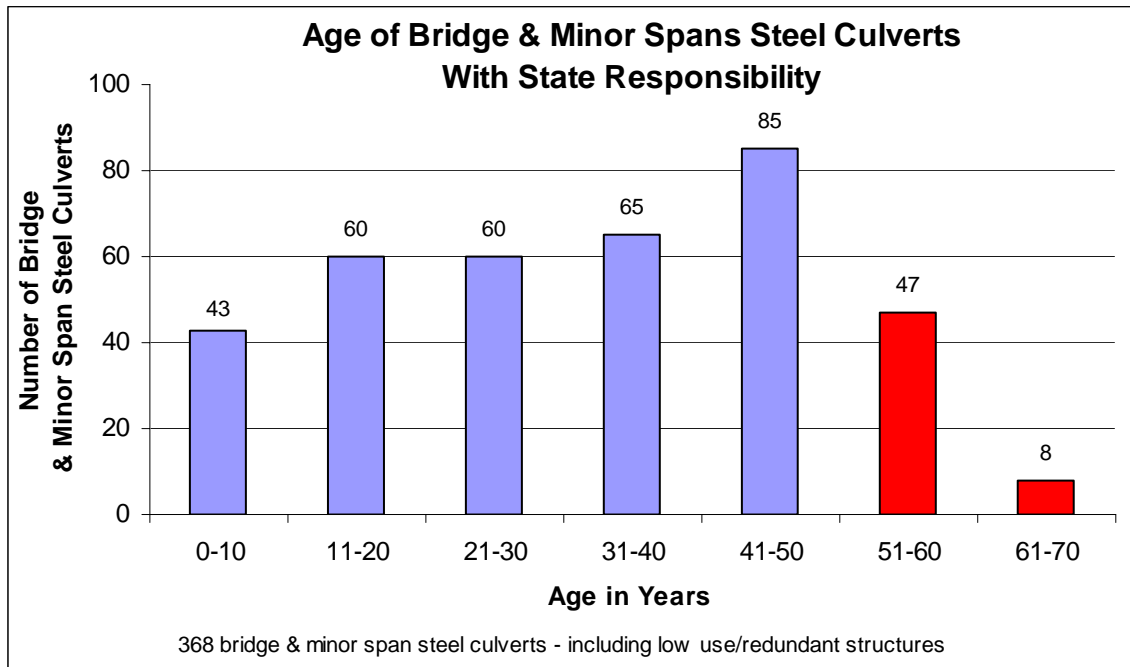
Of the 2,967 structures with state responsibility, 368 are steel culverts and 2,599 are traditional structures. The steel culverts typically have a service life of about 50 years while the traditional structures normally have a service life of about 80 years. While age is an indicator of future needs, it cannot be solely relied upon to determine the timing of capital improvements because design features, past maintenance actions, and environmental considerations also influence service life.

5.1.2 Age of Bridge & Minor Span Steel Culverts

In 2004, there were fifty-five (55) steel culverts that exceeded their normal service life of 50 years. Note the red bars in the chart shown below. Of the steel culverts older than 50 years, six (6) are already programmed for capital improvement and eleven (11) have been identified as candidates for the next Six-Year Plan. None of these structures over 50 years old are low use or redundant bridges.

5.0 Bridges

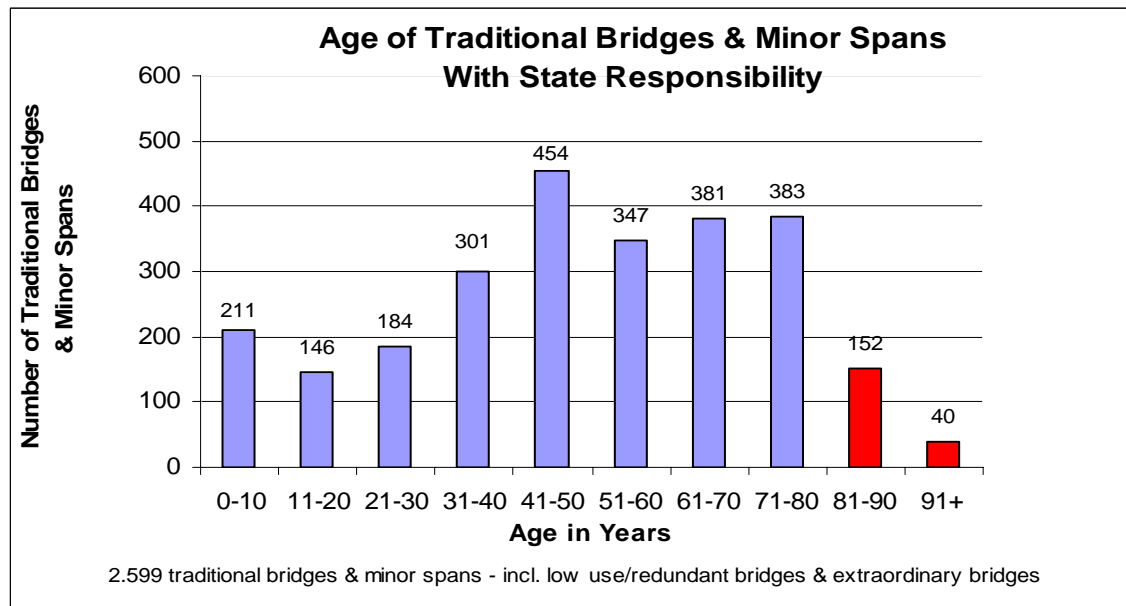
5.1 Age of Bridge & Minor Spans Steel Culverts



5.1.3 Age of Traditional Bridges and Minor Spans

In 2004, 192 of the traditional structures have exceeded their normal service life of 80 years, more than twice the number reported in the 2002 State of the System Report. Note the red bars in figure 5.2. Of this number, 4 structures (2%) have already been programmed for capital improvement and (3%) have been identified as candidates for improvement in the six-year plan. It should be noted that 13% of the traditional structures with an age greater than 80 years are low-use/redundant bridges.

5.2 Age of Traditional Bridges & Minor Spans



5.0 Bridges

5.2 Federal Sufficiency Rating (Percent Sufficient Bridges)

The sufficiency rating is based on a combination of four factors used to determine a number from 0 to 100 (0 is worst, 100 is best) that describes the overall sufficiency of each structure. The four factors are:

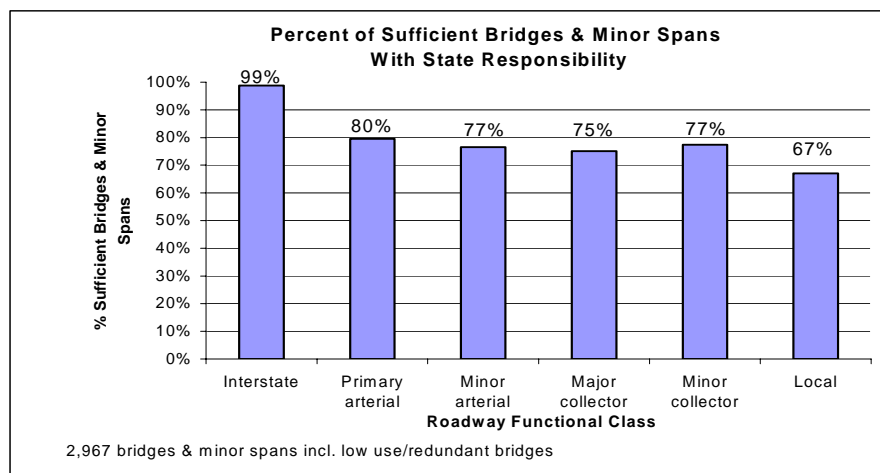
1. Structural Adequacy and Safety
2. Serviceability and Functional Obsolescence
3. Necessity for Public Use
4. Special Reductions (detour length, traffic safety features)

Bridges with a sufficiency rating of greater than 60 are considered to be structurally and functionally “sufficient” or unlikely to need capital improvements for at least 10 years, except for the possibility of paint or wearing surface work. Tracking the percentage of structures with a sufficiency rating of greater than 60 is a good proxy for the overall condition of Maine’s bridges and minor spans.

5.2.1 Sufficiency of Maine’s Bridges and Minor Spans

The chart that follows shows the percent of sufficient bridges and minor spans based upon the federal functional class of the roadway (excluding minor spans on town ways and extraordinary bridges). As expected, the vast majority of interstate structures are sufficient, whereas structures on local roads distinctly lag behind all others.

5.3 Percent of Sufficient Bridges and Minor Spans



Produced by the MaineDOT Bridge Management Section 2004

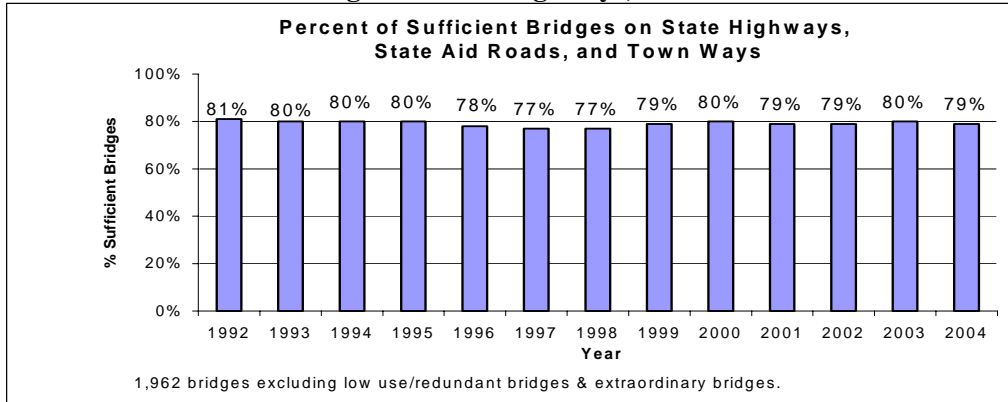
From 2000-04, the percentage of sufficient bridges and minor spans remained constant for the interstate with 99% of the structures in sufficient condition. The most significant increase in the number of sufficient structures was in the category of primary arterials (+2%), reflecting MaineDOT’s commitment to programming high benefit projects. There was no change in the percentage of sufficient structures carrying minor arterials and major collectors. There was a slight increase in the number of sufficient structures carrying local roads and a slight decrease in the number of sufficient bridges and minor spans carrying minor collector roads.

About 65% of the 2,967 structures with total or partial state responsibility are “bridges” on state highways, state aid roads and town ways. These are defined as structures greater than 20 feet in length.

5.0 Bridges

They represent the largest and most important piece of the state's roadway structure inventory. The following chart shows that 79% of these bridges are currently sufficient, and that this percentage has been fairly stable for the last decade. (This chart does not include low use/redundant bridges on town ways or extraordinary bridges.)

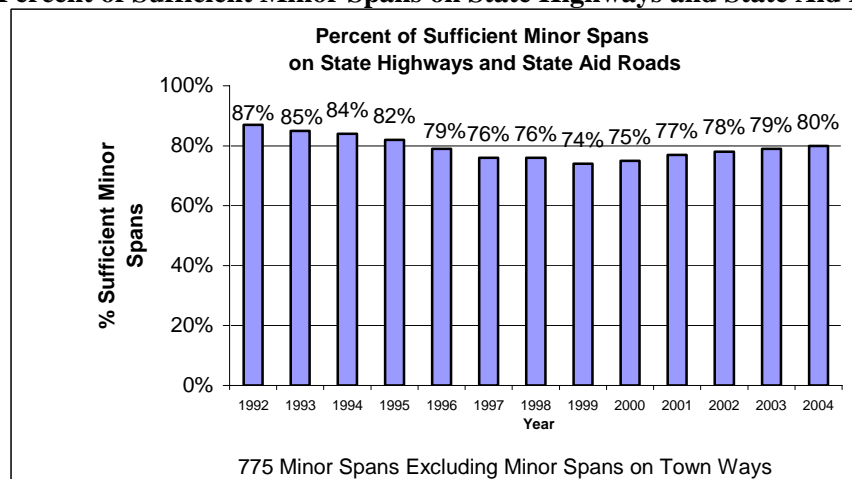
5.4 Percent of Sufficient Bridges on State Highways, State Aid Roads and Town Ways



The State of Maine is totally responsible for funding capital improvements for 775 minor spans that carry state aid roads or state highways. There has been an upward trend in sufficiency since 2000. In 2004, 80% of the minor spans with state responsibility were sufficient. However, even with this positive change in condition, the percentage of sufficient minor spans still remains below the 1992 level of 87% sufficient.

The present upward trend in the condition of minor spans is not unexpected, since funding for these structures increased significantly in the 2002-03 Capital Work Plan. If funding were to remain at a level similar to the 2006-07 work plan (about \$6 million/biennium), then that level of funding would be adequate to address the needs of minor spans for the next six years.

5.5 Percent of Sufficient Minor Spans on State Highways and State Aid Roads

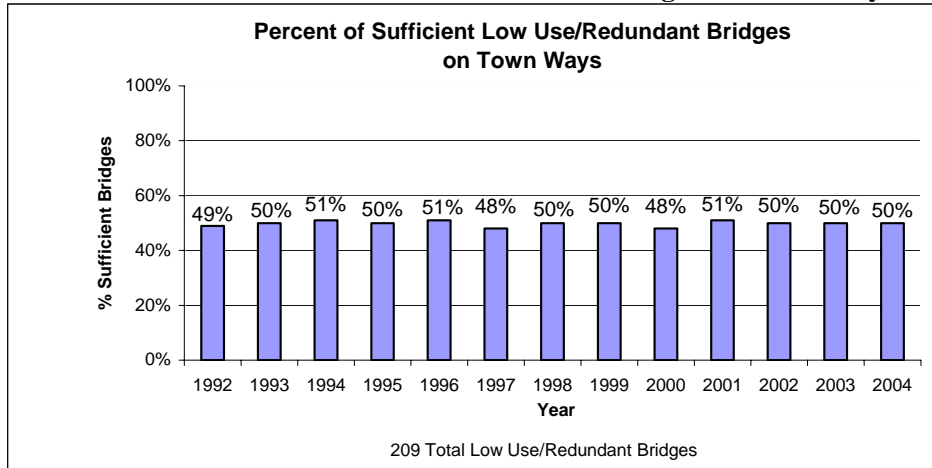


As a result of the Local Bridge Law passed in 2001, MaineDOT is partly responsible for 209 low-use/redundant bridges on town ways. As of 2004, 50% of the low use/redundant bridges were sufficient. The low priorities associated with low use/redundant bridges, together with anticipated shortfalls in funding, suggest that very few of these bridges will receive financial assistance in the near future.

5.0 Bridges

MaineDOT will continue to perform safety inspections on low use/redundant bridges, in order to protect the traveling public.

5.6 Percent of Sufficient Low use/Redundant bridges on Town Ways

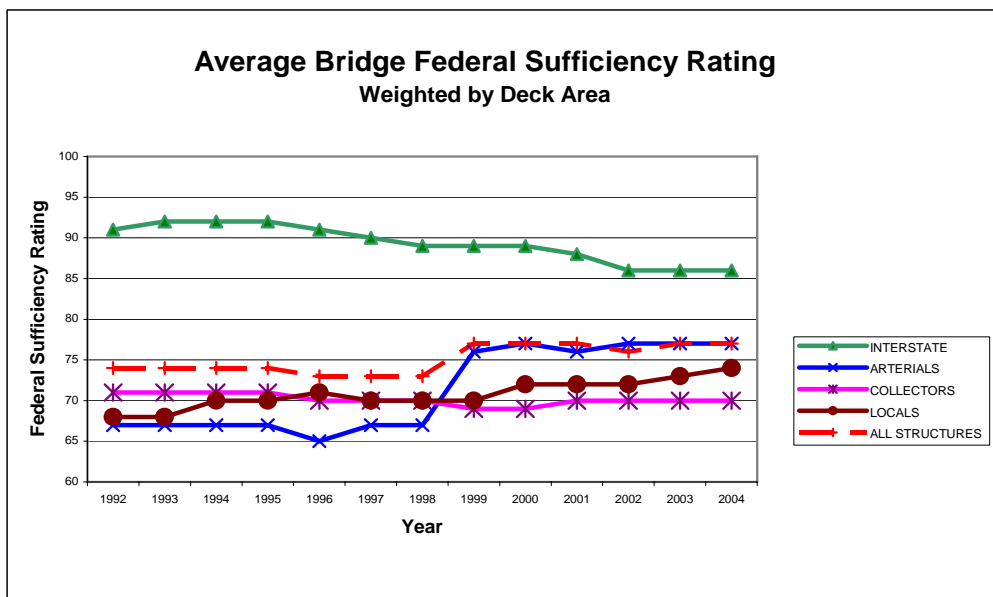


5.3 Bridge Adequacy

Another method of assessing the overall condition and functionality of Maine's structures is to use the average Federal Sufficiency Rating weighted by deck area. Weighting the sufficiency ratings by deck area will more accurately reflect the condition of the total bridge network because more weight is given to the sufficiency ratings of the larger structures which represent a larger proportion of the investment in the bridge network. As shown in figure 5.7, this indicator has proven quite consistent over time, with the exception of a significant increase in 1999 for bridges carrying arterial highways. This increase is attributed to capital improvement projects for eight large structures.

The 1992 to 2004 chart is based on the ratings of all 2,967 structures for which the state has responsibility, including extraordinary bridges and low-use/redundant bridges.

5.7 Average Bridge Federal Sufficiency Rating



5.0 Bridges

When weighted by deck area, the average federal sufficiency rating for Maine's structures remained at 77. While the total number of sufficient structures has increased, the improvements have not impacted enough of the total deck area to warrant a similar increase in this performance measure.

As one might expect, the structures carrying higher federal functional class roadways are in the best condition, reflecting MaineDOT's commitment to funding improvements for those structures that carry the most traffic and thus afford the most benefit to Maine's people and economy.

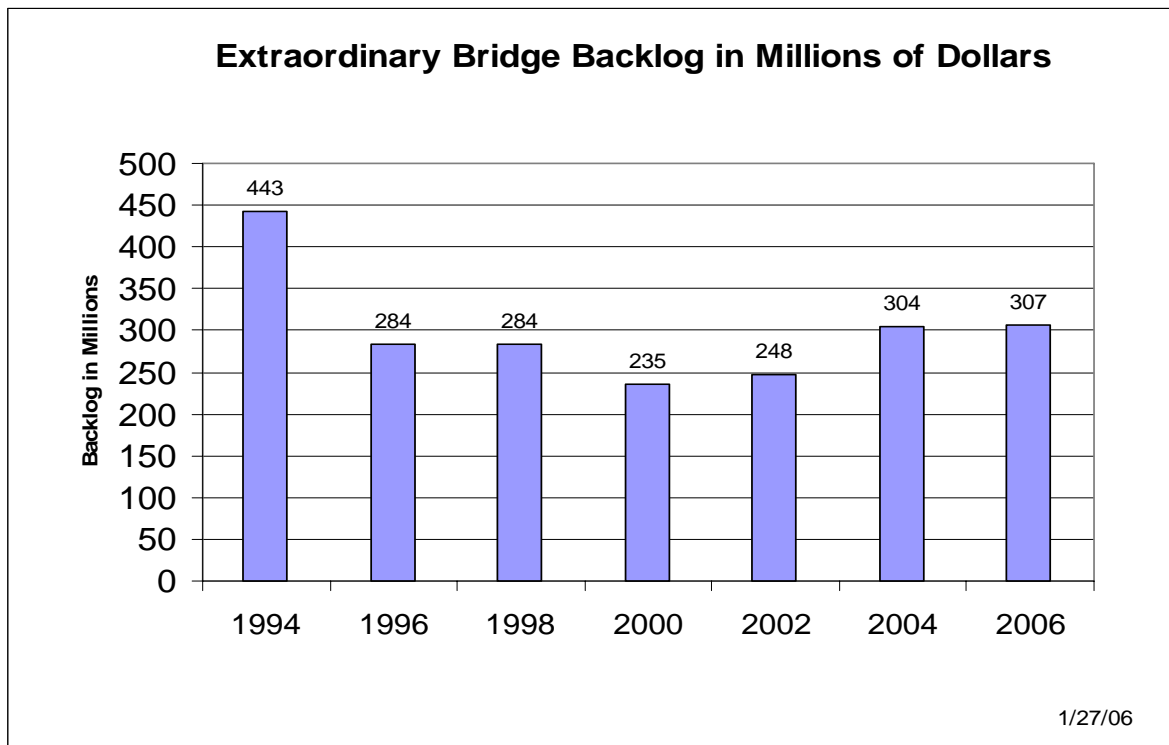
5.4 Extraordinary Bridges

Extraordinary bridges are 250 feet or more in length and have an improvement cost of at least \$5 million. MaineDOT has spent more than 1/2 of its total bridge improvement dollars over the last four biennia to fund projects that address the capital improvement needs of extraordinary bridges.

In 1994, the extraordinary bridges required \$443 million worth of capital improvements. The extraordinary bridge capital improvement needs have since been decreased to the current level of \$307 million. It is important to note that several of the 21 extraordinary bridges that still require capital improvement are in very poor condition.

There are some traditional bridges that are 250 feet or more in length with capital improvement costs approaching \$5 million each. Over time, inflation will cause the improvement costs to rise to \$5 million or more. At that point, these traditional structures will qualify as extraordinary bridges by definition, which will impact future funding scenarios.

5.8 Extraordinary Bridge Backlog in Millions of Dollars



While the extraordinary bridge capital improvement needs have been reduced by about one third over the past 12 years, there still remains an additional \$307 million worth of work to be done. Extraordinary

5.0 Bridges

bridge needs have been identified for the next 20 years and are summarized in figure 5.9, along with the cost of the improvement, and the remaining amount of funding required for completion of the work.

5.9 Extraordinary Bridge Needs 2004-2025

Town	Name	Age	Scope	Previous Funding	Projected Need 2008-2013	Projected Need 2014-2025
		Years		\$ Millions	\$ Millions	\$ Millions
Augusta	Memorial	56	Replace Deck & Paint	4.75	8	0
Bath-Woolwich	Carlton Bridge	79	Rehabilitation	23.325	12	0
Bath	West Approach	47	Improvement	2.3	0	35
Boothbay	Knickerbocker	75	Replacement	0.2	7	0
Brunswick-Topsham	Frank J. Wood	74	Improvement	1	0	10
Canaan	Sibley Pond	66	Replacement	0	0.5	8
Caribou	Aroostook River	53	Improvement	3	0	4
Deer Isle-Sedgwick	Deer Isle Sedgwick	66	Improvement	12	9	0
Fort Kent-New Brunswick	International	76	Improvement	2.11	11*	0
Greene	Turner Center	68	Improvement	0	5.7	0
Harpwell	Bailey Island	79	Superstructure Replacement	5.325	7	0
Howland	Penobscot River	59	Improvement	0.185	0	7
Howland	Piscataquis	77	Replacement	0	8.5	0
Jonesport-Beals	Beals Island	47	Improvement	0	0	25
Kittery-Portsmouth	Memorial Bridge	82	Rehab & Paint	2.1	22*	0
Kittery-Portsmouth	Sarah Mildred Long	65	Rehab & Paint	0	19.3	0
Norridgewock	Covered	77	Replacement	6	11.5	0
Portland-Falmouth	Martin Point	62	Improvement	0	0	25
Prospect-Verona	Downeast Gateway	0	Replacement	85	3.6	1.4
Prospect-Verona	Waldo Hancock	74	Removal	5.5	15	0
Richmond-Dresden	Maine Kennebec	74	Rehabilitation	1	15	0
Portland – S. Portland	Veterans Memorial	51	Replacement	0	31	0
York	New	48	Improvement	0	0.5	5
*Maine Share Only	Average Age:	66.1	Total Cost:	153.795	186.6	120.4

5.0 Bridges

5.5 Priority Functional Need Bridges

Priority functional need bridges are bridges and minor spans with needs that are solely functional. These bridges are functionally obsolete and not structurally deficient. The types of deficiencies include, but are not limited to, structures with insufficient vertical clearance, narrow bridges/minor spans, or structures with poor alignment. Of those structures classified as functionally obsolete, only those with a federal sufficiency rating of less than 60 are considered as potential priority functional need bridges/minor spans. A history of structure-related crashes does increase the possibility that a bridge or minor span will be included in this category, as does substantial public interest in improving the structure for functional reasons.

Generally, MaineDOT funds improvements that address structural deficiencies before programming improvements solely to correct functional problems. However, there are some safety considerations which allow a structure classified as a priority functional need to compete with a structurally deficient bridge/minor span for funding.

Presently, MaineDOT has identified eleven (11) structures as priority functional need bridges/minor spans. It is estimated that improvements necessary to correct these functional deficiencies will cost \$20 million. More than two thirds of the priority functional improvements identified will be bridge replacements. Other structures may be rehabilitated (e.g. widened) if they are deemed to be of historic value.

If the roadway and the structure are both considered functionally deficient, then the timing of the structural improvement may be coordinated with the roadway improvement to achieve cost savings and to minimize disruption to the traveling public.

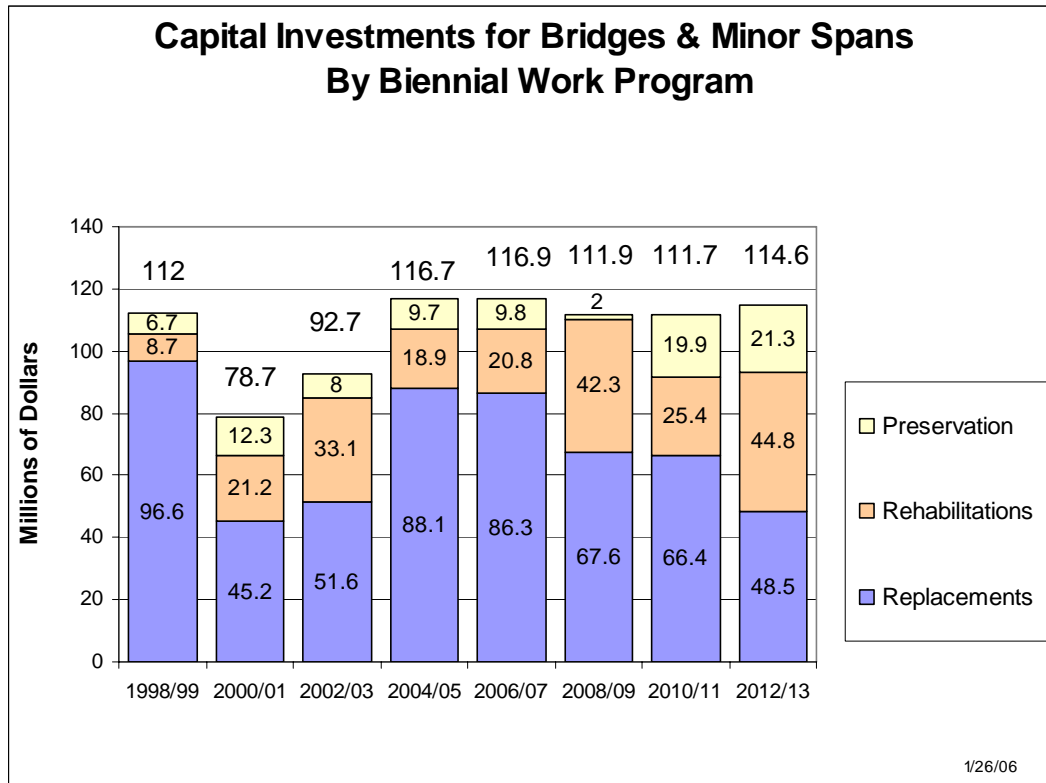


Arrowsic-Georgetown, Back River Bridge

5.0 Bridges

5.6 Funding Scenarios and Future Implications

5.10 Capital Investment for Bridges & Minor Spans



The chart above depicts the types of capital improvements programmed or projected for 1998 to 2013. The preservation work included in the capital work plan for bridges consists of wearing surface replacements and bridge painting. Over the last decade, an average of \$9 million per biennium has been expended on preservation improvements. The funding constraints in past capital work plans have caused needed preservation work (predominantly bridge painting) to be deferred. It is presently estimated that \$40 million will be required to paint structures in the next six (6) years. More than 1/3 of these monies will be required to paint two extraordinary bridges:

Kittery Memorial Bridge	\$ 7M
Augusta Memorial Bridge	\$ 8M

Less than 10% of the estimated preservation needs in the next six years consist of wearing surface replacements. Many highway paving projects now include bridge wearing surface replacements in order to minimize construction costs and to minimize construction disruption to the traveling public.

On average, MaineDOT has invested about \$25 million per biennium to rehabilitate bridges. Included in the rehabilitation category is a subcategory called “bridge improvements” which may be either rehabilitation projects or replacement projects based upon the findings of preliminary engineering studies.

While the 1998-1999 Work Plan was significantly higher than any other program in the past decade, the amount expended on extraordinary bridges has been fairly consistent, ranging from \$50-65 million per biennium. The 2008-2009 Capital Work Plan will fund at a slightly higher level at \$75 million of the total projected need of \$112 million.

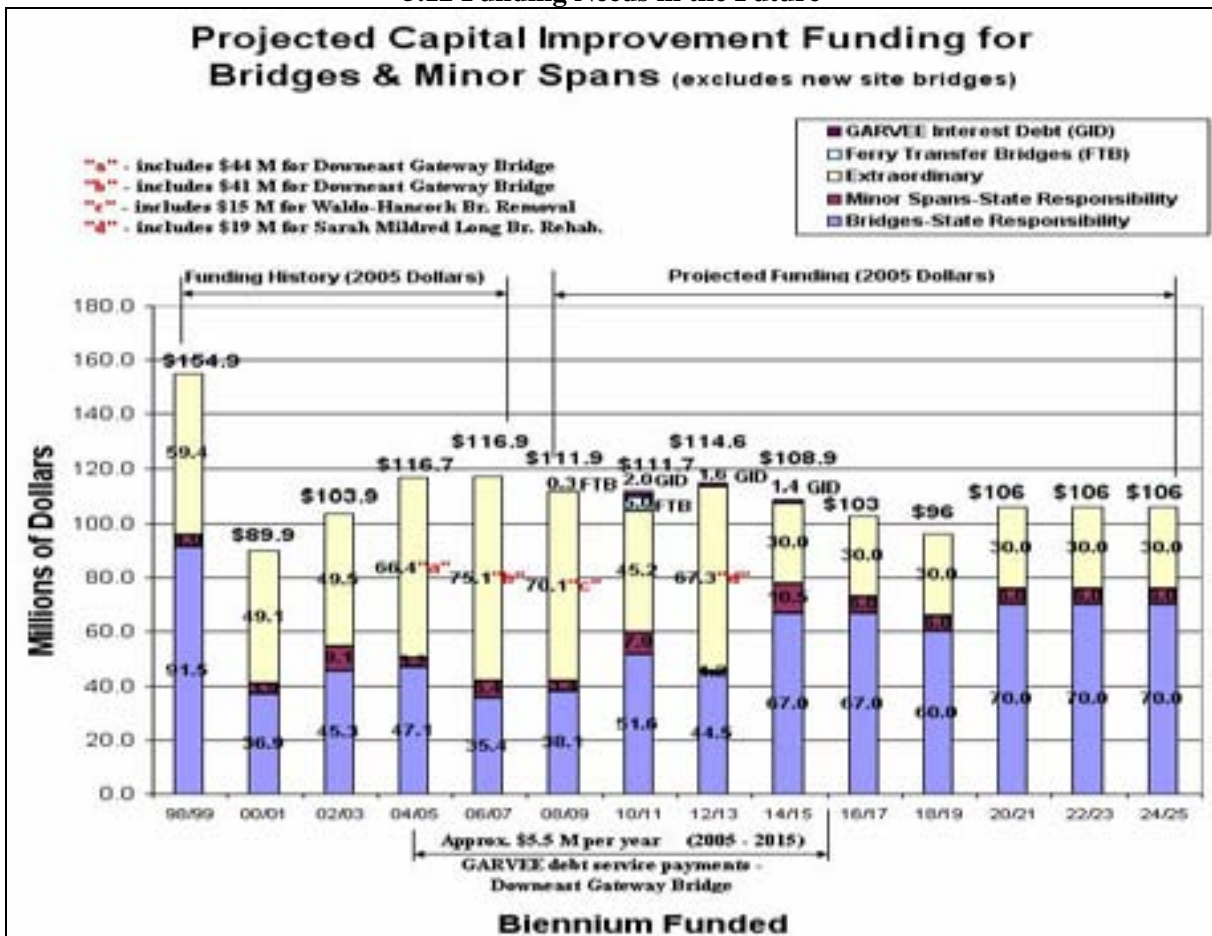
5.0 Bridges

The 2006-07 Capital Work Plan included only one project for a low use/redundant bridge at a cost of less than \$1 million. This level of funding is not adequate to address the needs of structures in this category. In 2004, only 50% of the low use/redundant bridges were sufficient (assigned ratings of 60 or above). If MaineDOT continues to fund these bridges at this level of funding per biennium, it is anticipated that the sufficiency of low use/redundant bridges will decline over the next 20 years. However, since municipalities and counties are primarily responsible for these bridges, several have been improved without MaineDOT involvement or cost sharing. Therefore some improvements in this category are possible solely based upon local initiatives.

The State of Maine is responsible for the cost of capital improvements for 1,962 bridges that are 20 feet long or more. This group of structures includes bridges on town ways, state highways, and state aid roads. Over the last six years, MaineDOT has expended an average of \$41.1 million per biennium to improve these structures and the result has been a slight decrease in the percentage of sufficient bridges. In 2004, 79% of these bridges were sufficient.

Figure 5.12 is based upon the assumption that there will be adequate funding for 2008-09 extraordinary bridge needs now estimated at \$70 million. The projected decrease in extraordinary bridge needs would allow a higher percentage of bridge funds to be expended on bridges on town ways, state highways, and state aid roads. Deferral of needed capital improvements results in further unchecked structural deterioration and may lead to even higher capital improvement costs.

5.12 Funding Needs in the Future



5.0 Bridges

The bridge projections in figure 5.12 above were established using the methodology developed in the MaineDOT Bridge Management Section. The scopes and costs of future improvements, and the timing of the improvements, were individually determined using inspection ratings and inventory data, and based in part on field reviews conducted by bridge engineers and environmental scientists. Figure 5.12 depicts the funding levels needed to address the bridge and minor span needs and the extraordinary bridge needs statewide over the next 20 years.

5.7 Conclusions

5.13 Maine Bridge Needs (in millions of 2005 dollars)

Bridge Network	2002-2003	2004-2005	2006-2007	STATUS QUO Investment Level (Average Over 3 Biennia)	To Maintain Constant Performance/Condition	Biennial Strategic Need
Extraordinary Bridges	49.5	66.4	75.1	63.7	50.0	70.8
Bridges	45.3	47.1	35.4	42.6	56.5	69.4
Minor Spans	9.1	3.2	6.4	6.2	6.0	7.6
Totals	103.9	116.7	116.9	112.5	112.5	147.8

The Strategic Need funding level for the bridge program is to address the needs identified in figure 5.12 for the next (2008 -2009) Work Plan. Funding the 2008 -2009 bridge program at this level of \$111.9 million would provide for a future performance/condition funding level of approximately \$106 million biennially. The consequence of deferring projects would include continued major maintenance and holding actions required to keep these structures in service.